

μ SR Spectroscopy of the Kondo Insulators $\text{Lu}_{1-x}\text{Yb}_x\text{B}_{12}$

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Single crystals of $\text{Yb}_{1-x}\text{Lu}_x\text{B}_{12}$ ($x = 0, 0.125, 0.5, 1$) were measured between 1.8 K and 300 K. Previous μ SR studies¹ on YbB_{12} powder were interpreted in terms of the development of extremely weak slowly-dynamic (~ 60 MHz) magnetic correlations of Yb moments of less than $10^{-2}\mu_B$ below ~ 10 K. The present data (based on a wider temperature range and a series of compounds) cannot confirm those conclusions. In contrast to the earlier work, we observed distinct changes with temperature of the shape of zero field spectra with characteristic temperatures of ~ 20 K, ~ 100 K and ~ 150 K. Also, we found no difference in behavior in the relaxation rate of the various $\text{Yb}_{1-x}\text{Lu}_x\text{B}_{12}$ compounds in a longitudinal field of 10 mT. Such a field largely suppresses the influence of the ^{11}B nuclear moments. In all compounds the relaxation rate peaked at 150 K. These findings exclude magnetic correlations as the origin of muon spin relaxational behavior. It is proposed that Yb carries no detectable moment and that the dominant features of the μ SR spectra arise from molecular dynamics, probably within the B_{12} clusters. This view is supported by recent ^{171}Yb NMR measurements² showing a minimum of $1/T_1$ around 15 K (i.e. close to one of the μ SR characteristic temperatures). Furthermore, comparing NMR results on ^{171}Yb and ^{11}B shows additional relaxation processes for the B ions to be present.

¹A. Yaouanc et al., Europhysics Letters, **47**, (1999) 247.

²K. Ikushima et al., Physica, **B274**, (2000) 274.